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STAFF REVIEW

OF

BINGHAMTON WASTEWATER MANAGEMENT STUDY

SUSQUEHANNA RIVER BASIN COMMISSION

SEPTEMBER 14, 1976

STAFF REVIEW

OF

BINGHAMTON WASTEWATER MANAGEMENT STUDY

PREPARED BY:
CHARLES S. TAKITA
SANITARY ENGINEER
DIVISION RESOURCES QUALITY
MANAGEMENT-PROTECTION

ROBERT J. BIELO
EXECUTIVE DIRECTOR

SUSQUEHANNA RIVER BASIN COMMISSION

5012 LENKER STREET

MECHANICSBURG, PENNSYLVANIA 17055

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INTRODUCTION

The Binghamton Wastewater Management Study, conducted by the Corps of Engineers, Baltimore, Maryland, encompasses the central urban core in Broome and Tioga Counties in New York. Included in the study area were the City of Binghamton, Johnson City, Endicott, Vestal, the Village and Town of Owego and the expanding developments in the Nanticoke Creek Valley, the Chenango River Valley and the Five Mile Point area (see Figure 1). The study was initiated in January 1974 after the New York State Department of Environmental Conservation (DEC) signed a letter of agreement officially committing the DEC to support the study. The Susquehanna River Basin Commission staff representatives attended the first public hearing held in March 1974 and an Interagency Study Management Group (ISMG) meeting in June 1974 as observers. The SRBC was invited to participate in the Technical Advisory Committee (TAC) in August 1974, and was officially recognized as an active member of the ISMG in November 1974. The SRBC staff reviewed all documents and provided informal staff input during the conduct of the study.

The report of the study is comprised of the following nine volumes:

a. Summary Document

b. Background Information Appendix

c. Plan Formulation Appendix

d. Comments Appendix

e. Specialty Appendix

f. Design & Cost Appendix

g. Impact Assessment & Evaluation Appendix

h. Institutional Analysis Appendix

i. Public Involvement Appendix

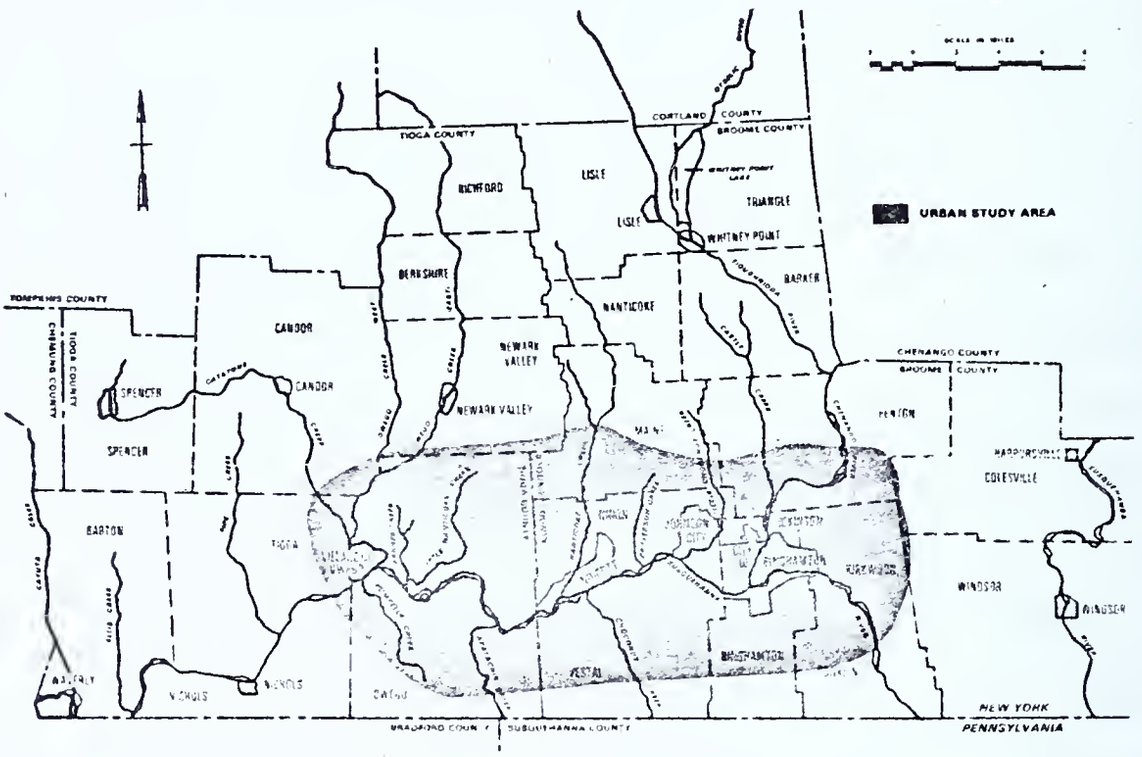

Figure 1 -- Wastewater Management Study Area

SUMMARY OF STUDY PROPOSALS

The proposals presented in the study investigated short-range plans for the next decade as well as long-range wastewater management plans to the year 2020. The four "Plans of Choice" with modifications for two plans, and the Stormwater Management Plan presented in the study are summarized below.

Plan 1 -- Baseline Plan

The Baseline Plan consisted of sewage treatment plants and interceptors that have been approved by the DEC and will be in existence in the study area by the year 1977 (base year). These treatment plants would be the Binghamton-Johnson City, Endicott, East Owego, West Owego and Owego Village sewage treatment plants (see Figure 2). The Chenango Valley area would remain on septic tank systems. This plan was considered the "no action" plan with five secondary treatment plants forming a static physical system subjected to future conditions projected to the year 2020. A gradual deterioration of water quality was projected. Violation of the N.Y. DEC dissolved oxygen standards (see Table 1) would occur with dissolved oxygen levels ranging between 3 and 4 mg/l during low flows. Possible health hazards could occur in the unsewered Chenango Valley area. Because no attempts would be made to control infiltration and combined sewer overflows, dissolved oxygen and bacteria standards would be violated during and after storms.

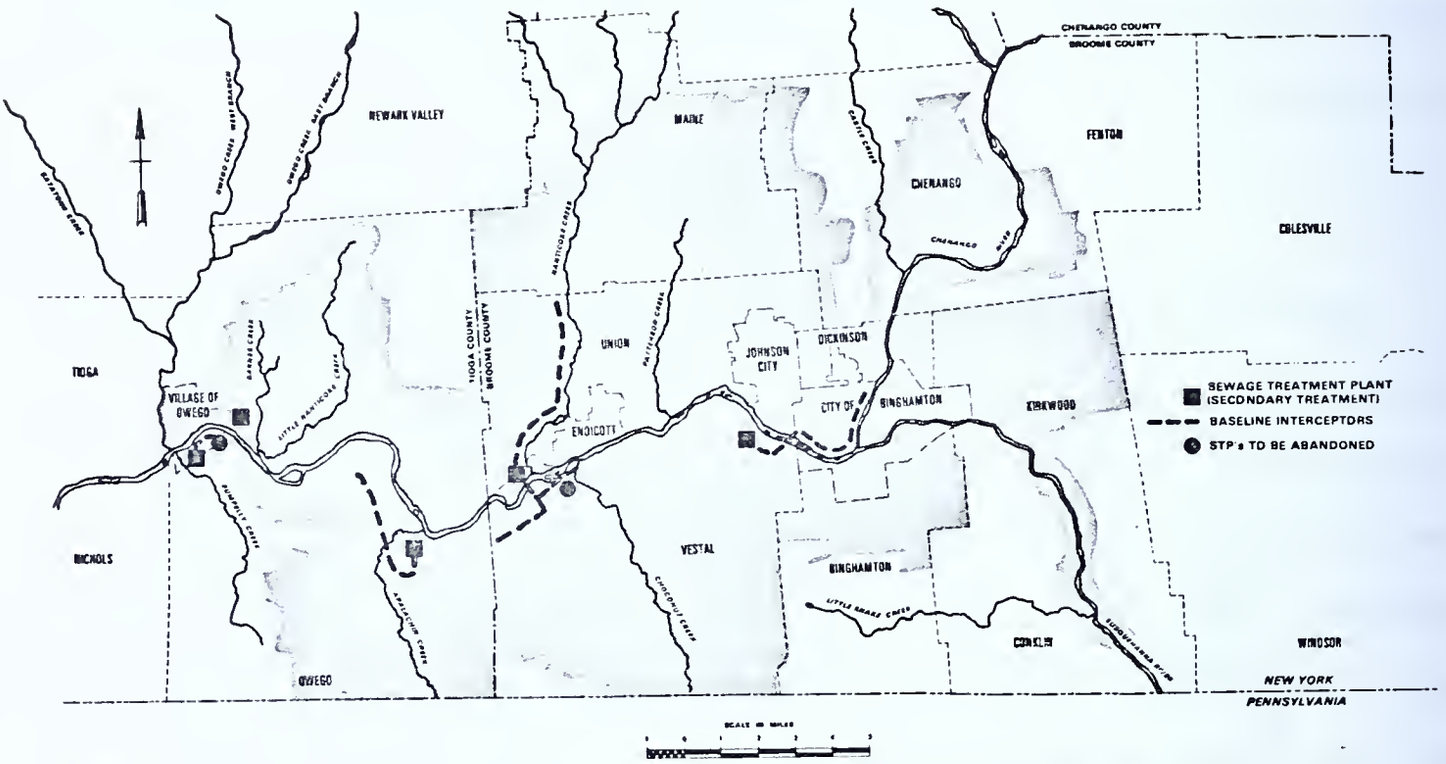

Figure 2 -- Plan 1 - Baseline Plan

Table 1 -- New York DEC Water Quality Standards for Class "B" and "C" Waters

Items	Class "B" Specifications	Class "C" Specifications
1. Coliform	The monthly median coliform value for 100 ml. of sample shall not exceed 2,400 from a minimum of five examinations and provided that not more than 20 percent of the samples shall exceed a coliform value of 5,000 for 100 ml. of sample and the monthly geometric mean fecal coliform value for 100 ml. of sample shall not exceed 200 from a minimum of five examinations. This standard shall be met during all periods when disinfection is practiced.	The monthly geometric mean total coliform value for 100 ml. of sample shall not exceed 10,000 and the monthly geometric mean fecal coliform value for 100 ml. of sample shall not exceed 2,000 from a minimum of five examinations. This standard shall be met during all periods when disinfection is practiced.
2. pH	Shall be between 6.5 and 8.5.	Same.
3. Total Dissolved Solids	None at concentrations which will be detrimental to the growth and propagation of aquatic life. Waters having present levels less than 500 milligrams per liter shall be kept below this limit.	Same.
4. Dissolved Oxygen	For cold waters suitable for trout spawning, the D.O. concentration shall not be less than 7.0 mg/1 from other than natural conditions. For trout waters, the minimum daily average shall not be less than 6.0 mg/1. At no time shall the D.O. concentration be less than 5.0 mg/1. For non-trout waters, the minimum daily average shall not be less than 5.0 mg/1. At no time shall the D.O. concentration be less than 4.0 mg/1.	Same.
5. Ammonia or Ammonium Compounds	Not greater than 2.0 milligrams per liter expressed as NH_3 at pH of 8.0 or above.	None.

Plan 2 -- Plan to Maintain Minimum Stream Dissolved Oxygen of 4 mg/l

Plan 2 was developed to meet the water quality objective of maintaining dissolved oxygen levels between 4 and 5 mg/l during the minimum average seven-consecutive-day ten-year low flow (MA-7-CD-10) periods. The overall plan represented a course for minimum action and minimum financial impact to comply with the N.Y. DEC water quality standards. Plan 2 utilizes the existing sewage treatment plants shown in Plan 1 with some additional features and phased expansion of some plants as dictated by projected flows. All sewage treatment plants (STP) would provide secondary treatment with infiltration control in the City of Binghamton to provide an average of one million gallons per day flow reduction to the Binghamton-Johnson City STP. Sludge generated by the treatment processes would be applied to farmland.

The following three options for meeting the objective of this plan were investigated.

Optional Plan 2A

Plan 2A provides for two STP's in Broome County and three STP's in Tioga County, N.Y. (see Figure 3). A small pumping station would be located in Chenango Valley, and a new force main would convey the Chenango Valley wastewater to the northern end of the Binghamton-Johnson City sewerage system just west of

the Chenango River. The sewage would then be discharged into the existing interceptor for treatment at the Binghamton-Johnson City STP. The pumping station would also provide 10 hours of storage for the Chenango Valley wastewater flows when peak wet-weather flows in Binghamton may result in combined sewer overflows.

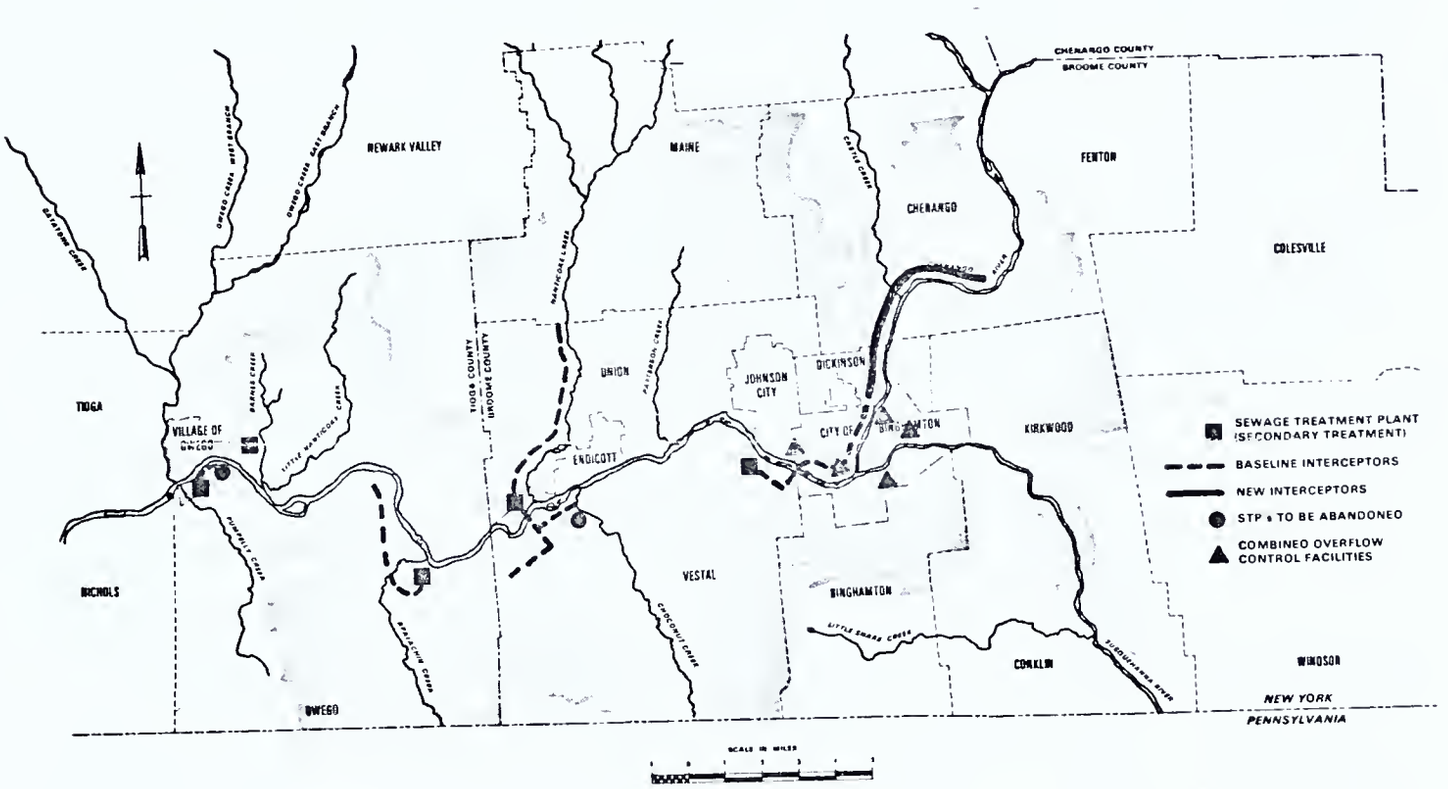

Figure 3 -- Plan 2A - Plan to Maintain Minimum Stream Dissolved Oxygen of 4 mg/l

Optional Plan 2B

Plan 2B provides for three STP's in both Broome and Tioga Counties, N.Y. (see Figure 4). A new STP would be constructed in Chenango Valley with its effluent discharging into the Chenango River. The new STP would provide full service to all of Chenango Valley immediately after completion.

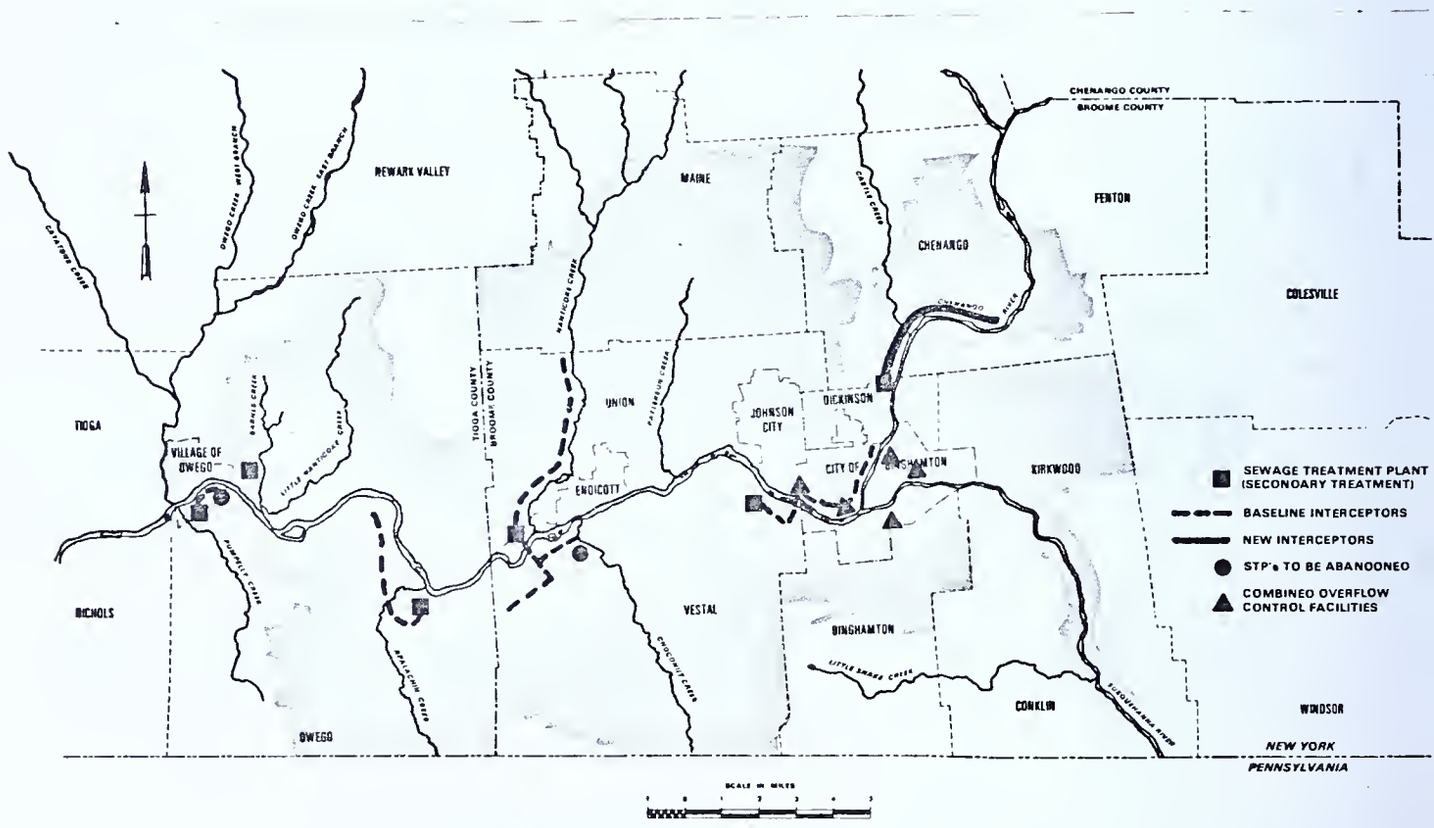

Figure 4 -- Plan 2B - Plan to Maintain Minimum Stream Dissolved Oxygen of 4 mg/l

Optional Plan 2C

Plan 2C is similar to Plan 2B and provides for three STP's in both Broome and Tioga Counties (see Figure 5). The new STP in Chenango Valley would be in the form of an interim plant which would initially provide service to a limited area along the west bank of the Chenango River in most immediate need of sewer service. This initial service area could then be expanded, along with the Chenango Valley STP, to cover additional areas as time and money permitted.

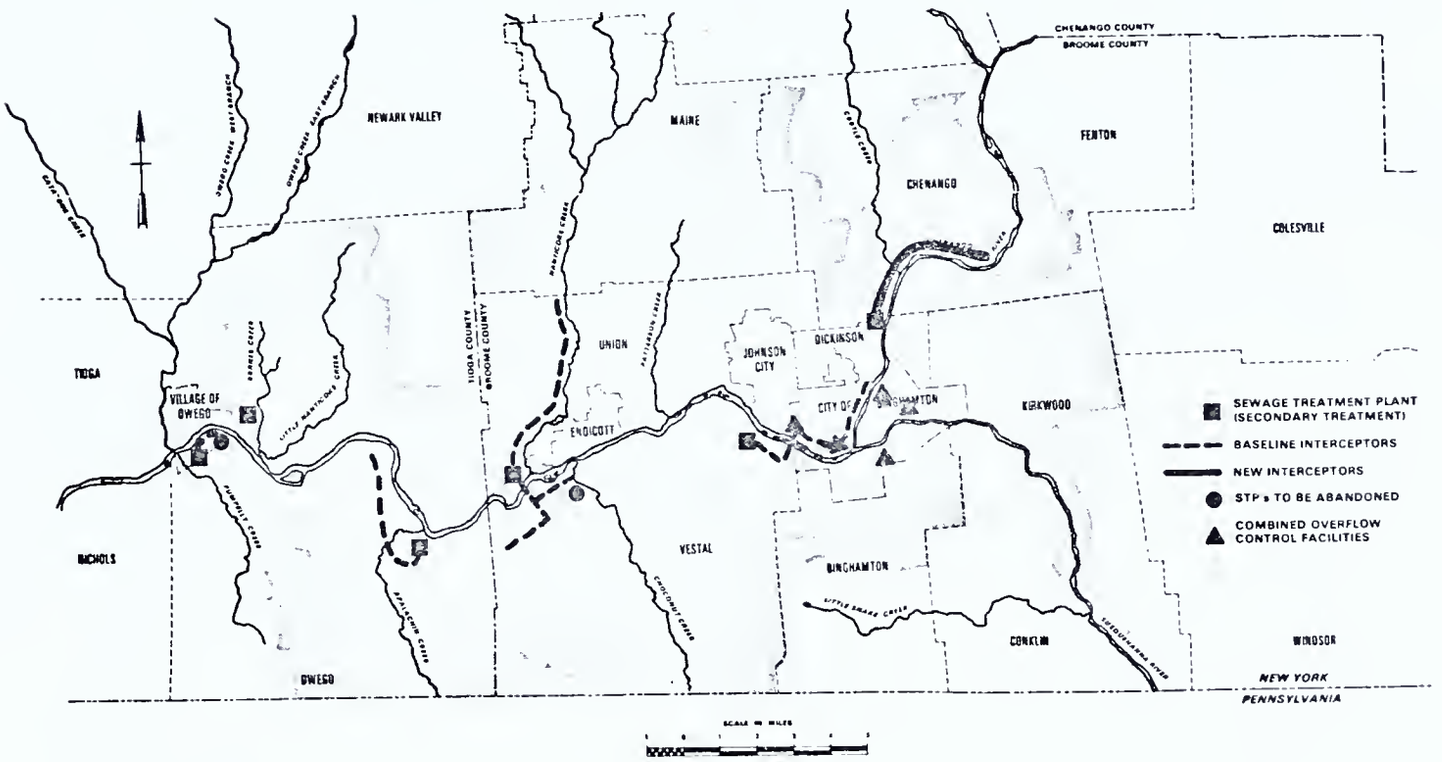

Figure 5 -- Plan 2C - Plan to Maintain Minimum Stream Dissolved Oxygen of 4 mg/l

Plan 3 -- Plan to Maintain Minimum Stream Dissolved Oxygen of 5 mg/l

Plan 3 was developed to meet a slightly.higher water quality objective of maintaining dissolved oxygen levels between 5 and 6 mg/l during the MA-7-CD-10 flow periods. The plan utilizes the existing STP's shown in Plan 1 with additional features and phased expansion as dictated by projected flows. Nitrification was added to the treatment process at the Binghamton-Johnson City STP which is the largest plant in the study area. All other STP's in the study area would provide secondary treatment. Additionally, infiltration control in the City of Binghamton would be provided to reduce the flows an average of 3 million gallons per day to the Binghamton-Johnson City STP. Sludge would be disposed of on farmland.

The same three options as in Plan 2 were investigated.

Optional Plan 3A

Plan 3A provided for two STP's in Broome County and three STP's in Tioga County, N.Y. (see Figure 6). A small pumping station would be located in Chenango Valley, and a new force main would convey the Chenango Valley wastewater to the northern end of the Binghamton-Johnson City sewerage system just west of the Chenango River. The sewage would then be discharged into the existing interceptor for treatment at the Binghamton-Johnson City STP. The pumping station would also provide 10 hours of

storage for the Chenango Valley wastewater flows when peak wet-weather flows in Binghamton may result in combined sewer overflows.

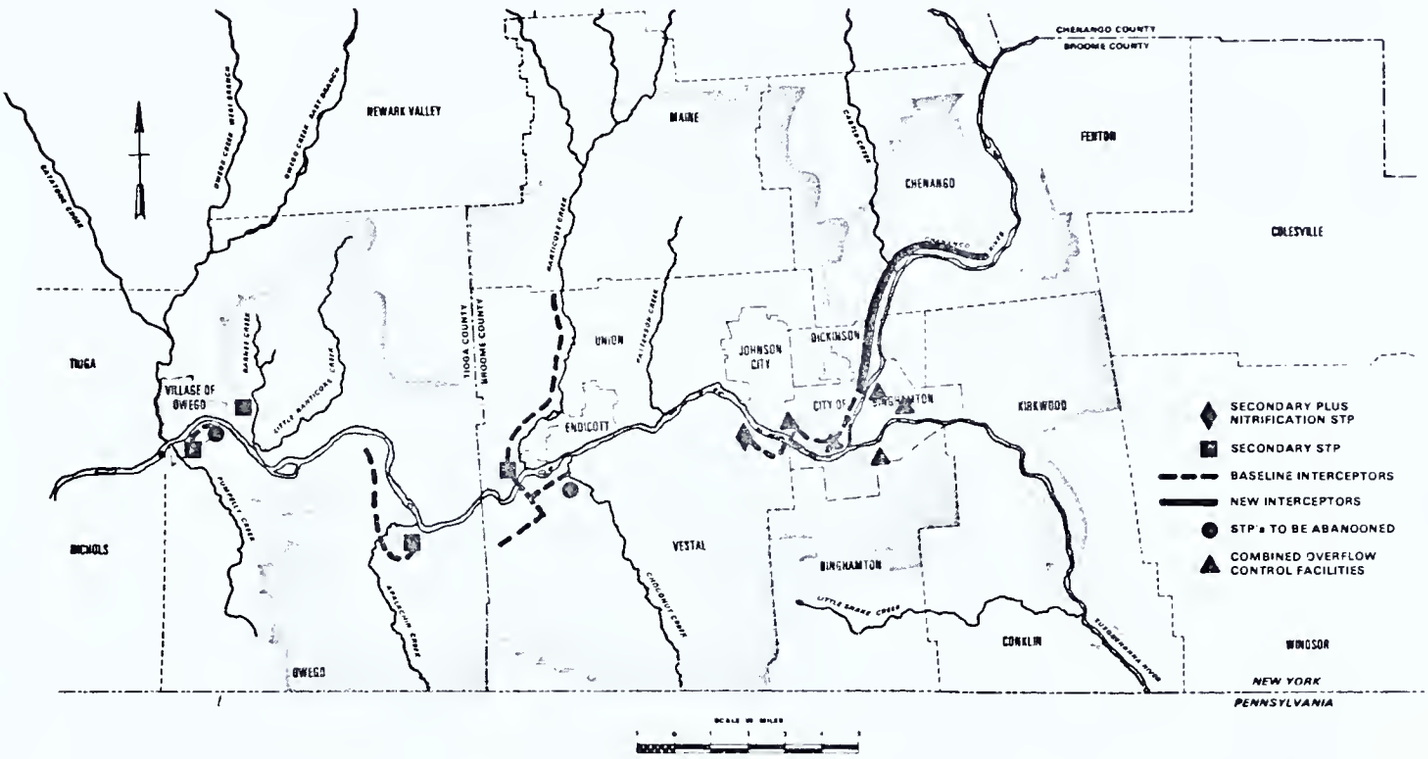

Figure 6 -- Plan 3A - Plan to Maintain Minimum Stream Dissolved Oxygen of 5 mg/l

Optional Plan 3B

Plan 3B provided for three STP's in both Broome and Tioga Counties (see Figure 7). A new STP would be constructed in Chenango Valley with its effluent discharging into the Chenango River. The new STP would provide full service to all of Chenango Valley immediately after completion.

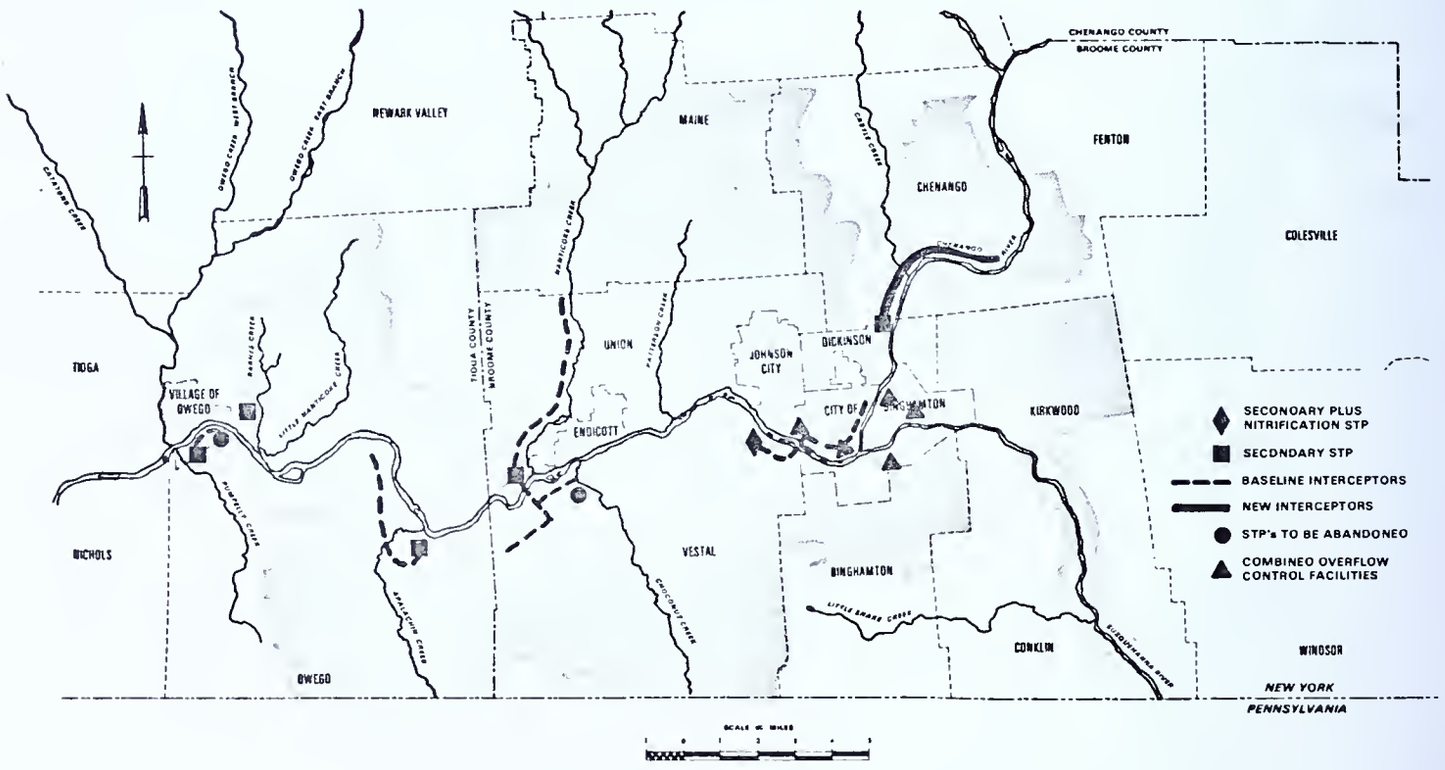

Figure 7 -- Plan 3B - Plan to Maintain Minimum Stream Dissolved Oxygen of 5 mg/l

Optional Plan 3C

Plan 3C provided for three STP's in both Broome and Tioga Counties (see Figure 8). The new STP in Chenango Valley would initially provide sewer service to a limited area along the west bank of the Chenango River in most immediate need of sewer service. This initial service area could then be expanded, along with the Chenango Valley STP, to cover additional areas as time and money permitted.

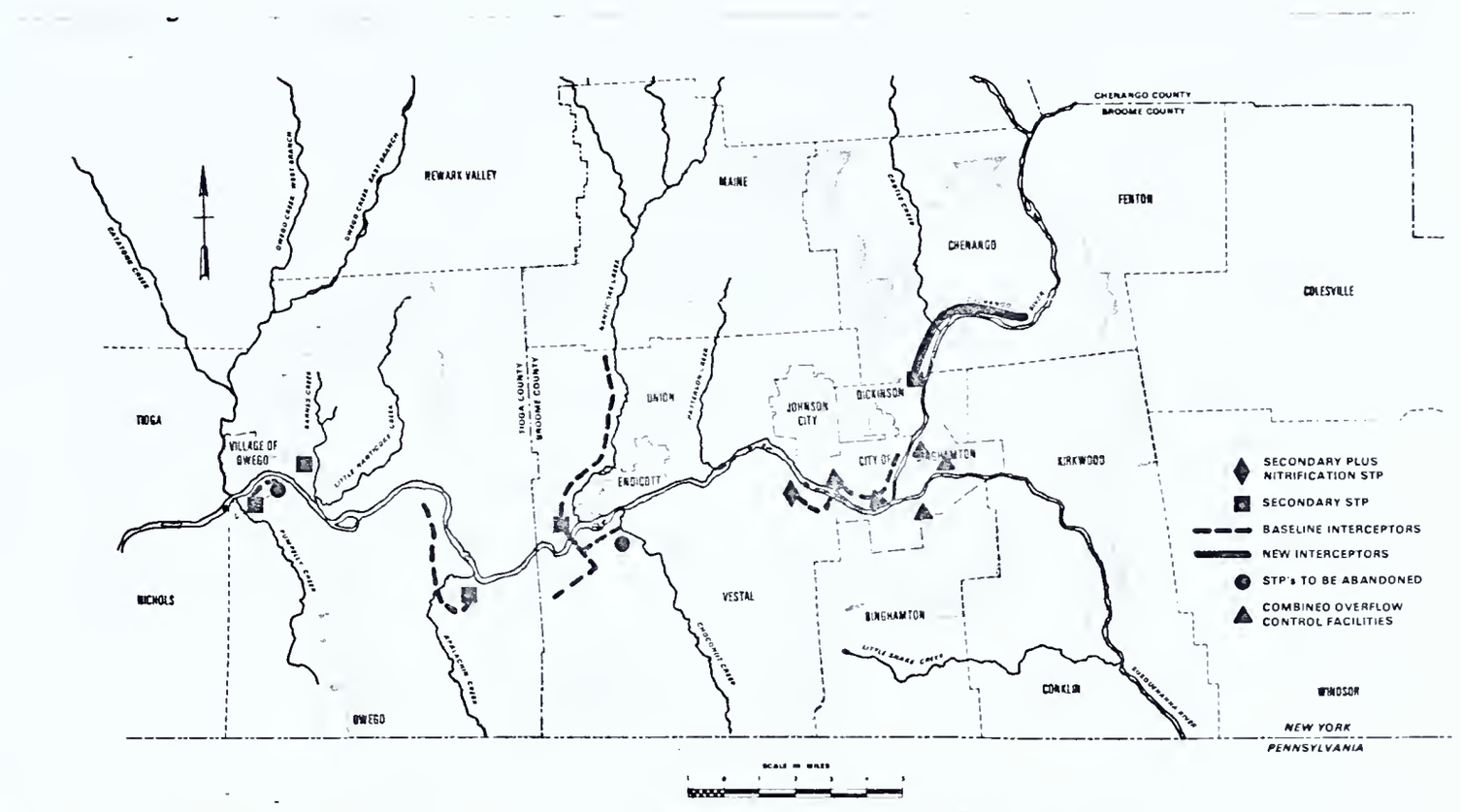

Figure 8 -- Plan 3C - Plan to Maintain Minimum Stream Dissolved Oxygen of 5 mg/l

Plan 4 -- Advanced Waste Treatment (AWT)

Plan 4 provides for achieving the highest level of water quality by approaching the 1985 "no discharge" goal in P.L. 92-500 through biologically-based advanced wastewater treatment. Secondary treatment would be followed by denitrification, phosphorus removal, filtration and carbon adsorption to remove almost all pollutants. Economies of scale and engineering analyses indicate that two sewage treatment plants in each county as shown in Figure 9 would provide the optimum arrangement of treatment plants. Infiltration control measures would be implemented under this plan to achieve an average flow reduction of 3 million gallons per day. Sludge would be disposed of on farmlands. Additionally, a public education program coupled with a pricing and metering program to maintain per capita wastewater flows at current volumes would be implemented.

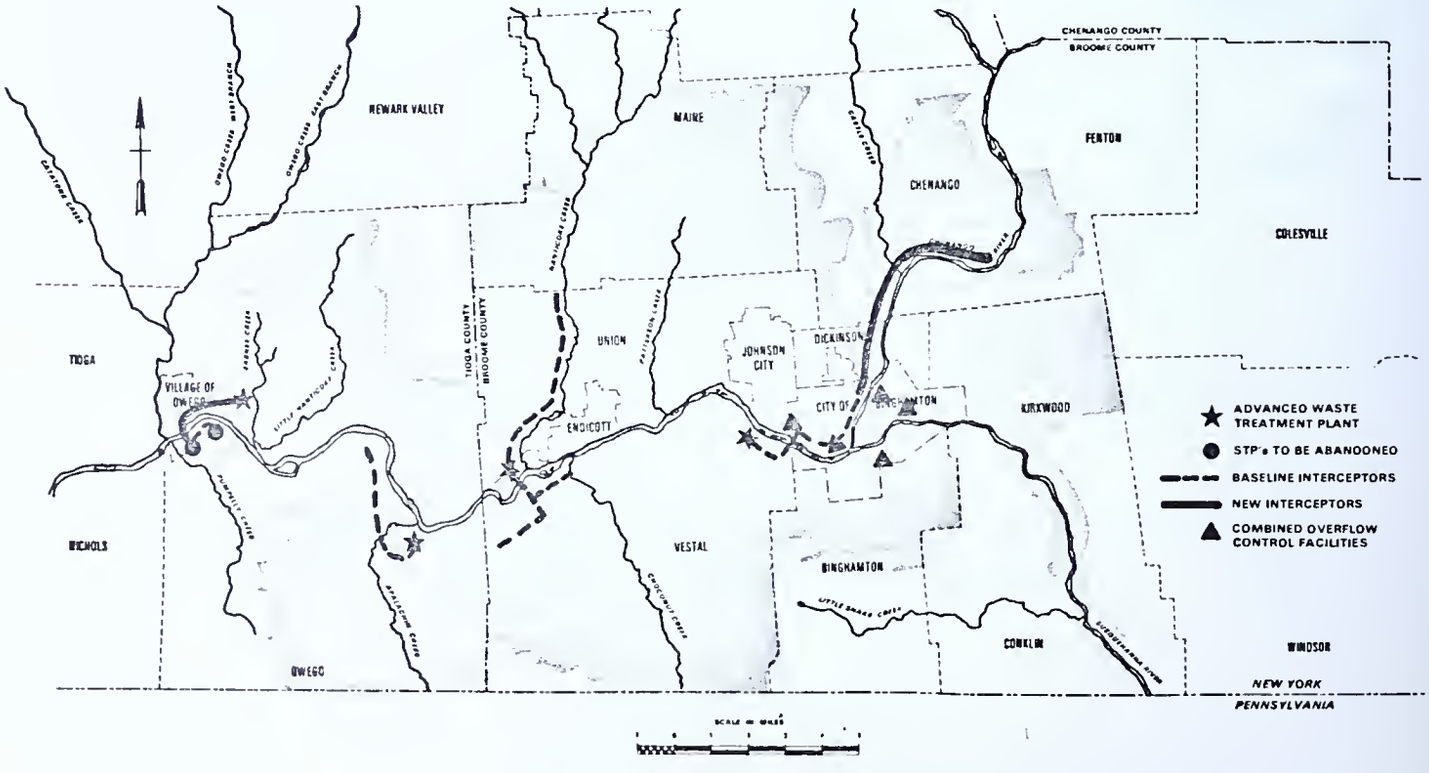

Figure 9 -- Plan 4 - Advanced Waste Treatment

Stormwater Management

Stormwater Management measures were designed to handle the overflow volume and pollutant magnitudes from the five largest combined sewer overflows in the City of Binghamton (see Figure 10), and at Owego Village. Because there were no specific regulations requiring secondary treatment for combined overflows, an alternative was selected that provided a cost-effective approach while maintaining a dissolved oxygen concentration in the stream above the minimum standard of 4 mg/l. Construction of microstraining and chlorination facilities at the overflow sites was the method selected for stormwater treatment under Plans 2, 3 and 4.

STUDY RECOMMENDATION

Plan 2C which would provide secondary treatment of wastewater at six sewage treatment plants (interim plant at Chenango Valley) was specifically recommended as the plan of choice with the remaining plans as alternative choices. Plan 2C also includes microstraining and chlorination of stormwater at five overflow sites in the City of Binghamton and at Owego Village.

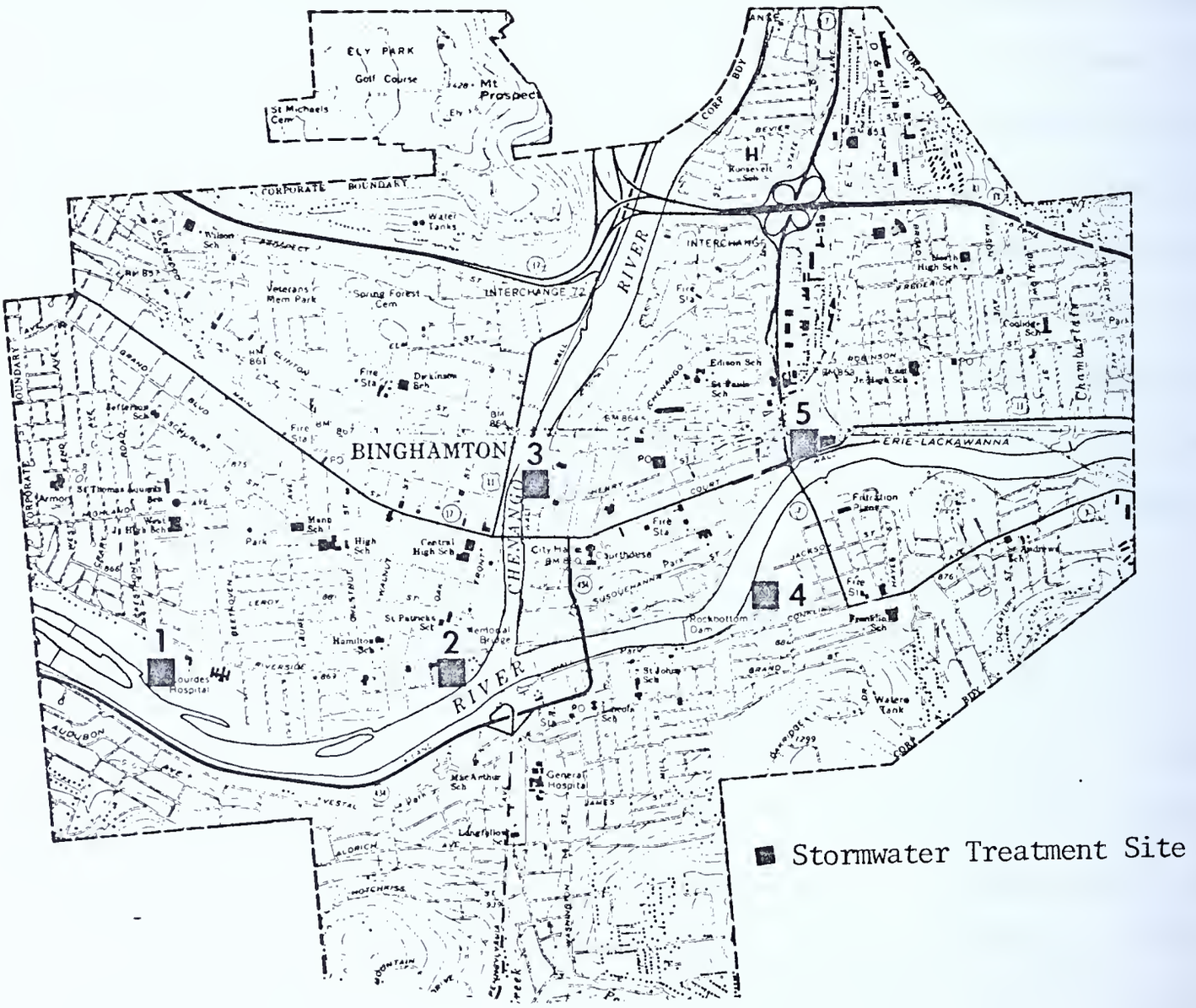

Figure 10 -- Stormwater Management in the City of Binghamton

SUSQUEHANNA RIVER BASIN COMMISSION STAFF COMMENTS

The SRBC staff participated in the Technical Advisory Committee and the Inter-agency Study Management Group meetings during which times informal staff input was provided to develop wastewater management plans that would be compatible with the intent of the SRBC Comprehensive Plan.

The rationale used in arriving at the study recommendation is as follows:

1. Level of Treatment -- Plan 1 is basically a "no action" plan and would result in violation of stream dissolved oxygen standards and degradation of water quality. Plan 2 requires secondary treatment at all plants to provide a minimum dissolved oxygen of 4.0 mg/l during the 7-day 10-year low flow and satisfies stream standards. Plan 3 adds nitrification to the Binghamton-Johnson City treatment plant to provide a minimum dissolved oxygen of 5.0 mg/l during the 7-day 10-year low flow. Cost analysis shows that cost of Plan 2 is much less than Plan 3. Impact assessment does not indicate substantial increases in benefits by going to higher treatment in Plan 3, and DEC would not be able to justify the additional cost to achieve this small increase in benefits. Advanced waste treatment (Plan 4) is the most costly plan and is considered to be least acceptable to the local taxpayers. Therefore, Plan 2 with microscreening and chlorination of stormwater is considered to provide the most acceptable level of treatment.

2. Degree of Regionalization -- Analysis indicated that two-plant regionalization was the cost-effective alternative for Plan 4 (Advanced Waste Treatment). A three-plant regionalization scheme was the cost-effective alternative for Tioga County in Plans 2 and 3. Regionalization in Broome County presented a choice of providing a separate treatment plant at Chenango Valley or transporting the wastes from Chenango Valley to the Binghamton-Johnson City plant for treatment. Analysis indicated no substantial benefits of one choice over the other. Therefore, the major considerations in arriving at degree of regionalization in Broome County were the acceptability of each plan to the public and need for sewer service in the Chenango Valley area. The three-plant scheme was considered to be most amenable for timely establishment of institutional arrangements and most acceptable to the public. Construction of a separate treatment plant with phased sewering was considered to be most acceptable to the Chenango Valley residents.

3. Ammonia Standard -- The ammonia standard for Pennsylvania waters is 1.5 mg/l which is lower than that for New York waters. However, ammonia concentration in the stream within the study area is expected to be about 1.6 mg/l which meets the New York State DEC standard. The furthest downstream sewage treatment plant discharge will be at Owego Village which is approximately 16 miles from the New York-Pennsylvania stateline.

The study recommendations were discussed with the Pennsyl-

vania Department of Environmental Resources. No problems or violation of Pennsylvania standards are anticipated from implementation of either Plans 2, 3 or 4.

SUSQUEHANNA RIVER BASIN COMMISSION STAFF CONCLUSIONS

Plan 1, Baseline Plan, is not compatible with the intent of the Susquehanna River Basin Commission Comprehensive Plan. Plan 1 is basically a "no action" plan and would result in violation of stream dissolved oxygen standards and degradation of water quality. Therefore, Plan 1 is unacceptable.

The other action plans (Plans 2, 3 and 4) and options developed during the study are compatible with the intent of the Commission's Comprehensive Plan. Plans 2 and 3 optimize regionalization of treatment plants at each of the respective treatment levels. Plan 2 provides only secondary treatment to meet current stream standards, but could be modified easily to provide the higher level of treatment of Plan 3 to meet more stringent stream standards. Plan 3 incorporates best practicable waste treatment which is the 1983 national goal. Best practicable waste treatment technology has not been clearly defined at this time and for some municipal treatment plants may prove to be only secondary treatment. Plan 4, Advanced Waste Treatment, provides the optimum of waste treatment and regionalization, but would most likely not be economically feasible or acceptable at this time.

It is the opinion of the staff that Plan 2C furnishes a good foundation on which to build any future plans for wastewater management in the study area. On a long-term basis, Plan 2C will keep open possibilities for future action. Stream standards would be met by this plan. If higher levels of treatment are required in the future, this plan lends itself to staged construction in either Broome County or Tioga County. Nitrification is the next logical step from Plan 2C with only add-on unit processes necessary such as was proposed in Plan 3. The staff favors Plan 2C because it provides the logical starting point in arriving at a biological-based advanced waste treatment as proposed in Plan 4.

SUSQUEHANNA RIVER BASIN COMMISSION STAFF RECOMMENDATIONS

Based upon this review and its conclusions, the staff recommends to the Commission that:

1) The Commission accept this staff report as the Commission's evaluation of the study.

2) The Commission adopt a resolution (see Appendix) that would recognize that Plan 2 satisfies the minimum acceptable requirements under the Commission's Comprehensive Plan, indicating a preference for Plan 2C.

3) The Commission delay incorporating any part of the study into the Comprehensive Plan pending appropriate action by State and/or local officials regarding which plan will be implemented.

APPENDIX - RESOLUTION NO. 76-5

RESOLUTION NO. 76-5

A RESOLUTION by the Susquehanna River Basin Commission regarding the Binghamton Wastewater Management Study conducted by the U.S. Army Corps of Engineers.

WHEREAS, purposes of the Susquehanna River Basin Compact are to remove causes of possible controversy; to provide for cooperative and coordinated planning; and to provide and encourage the proper management, conservation, and utilization of the basin's water resources; and

WHEREAS, to carry-out these purposes, the Commission has reviewed the Binghamton Wastewater Management Study conducted by the U.S. Army Corps of Engineers, Baltimore District Office; and

WHEREAS, it has been determined that "Plan of Choice" #2 set forth in the Corps' Study satisfies the minimum requirements of the Commission's Comprehensive Plan; and

WHEREAS, one water quality goal of the Commission's Comprehensive Plan is the regionalization of wastewater treatment and collection systems to the extent that it is economically and technically feasible, and environmentally responsible; and

WHEREAS, the Binghamton Wastewater Management Study fulfills a water quality recommendation of the Early Action Program within the Commission's Comprehensive Plan, namely, implementation or completion of regional wastewater management studies for urban and urbanizing areas within the basin; and

WHEREAS, the Binghamton Wastewater Management Study is listed as part of the Commission's current Water Resources Program and is in accord with it;

NOW THEREFORE BE IT RESOLVED THAT:

1) "Plan of Choice" #2 set forth in the Binghamton Wastewater Management Study satisfies the minimum requirements of the Commission's Comprehensive Plan; however, Optional Plan 2c is recommended to assure accommodation both of the area's future economic growth, and proper utilization and conservation of the water resources.

2) The Commission recommendation on "Optional Plan" 2c notwithstanding, the Commission shall adopt the "Plan of Choice" selected by the appropriate state agency and/or local government into the Commission's Comprehensive Plan, PROVIDED, the "Plan of Choice" is compatible therewith.

3) The Commission accepts the draft staff review report on the Corps' Binghamton Wastewater Management Study as the Commission's evaluation of the study, and authorizes the Executive Director to so inform interested parties such as the Corps of Engineers, Baltimore District, local government officials in the Binghamton, New York area, and the New York Department of Environmental Conservation.

September 14, 1976
Date Adopted

Chairman

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